

## LESSON 8: COLD WEATHER INJURIES



dehydration  
frostbite  
hypothermia  
insulate  
precipitation  
subcutaneous  
superficial

### INTRODUCTION

It is common to think that only in areas where snow and frost are present, people are susceptible to cold weather injuries. Prolonged exposure to low temperatures, wind or moisture — whether it be on a ski slope or in a stranded car — can result in cold-related injuries such as frostbite and hypothermia, no matter where you live if you are not prepared.

### FACTORS TO CONSIDER

#### WEATHER

Low temperature, high humidity, **precipitation**, and high wind may affect the loss of body heat. Wind chill (the temperature of both the wind speed and air temperature combined) speeds up the loss of body heat and may aggravate cold injuries. By studying the Wind Chill Chart, you can determine the chilling effect that wind speed has on temperature.

#### STRESS

When in a stressful situation, people are more likely to experience fear, fatigue, dehydration, and lack of nutrition. These factors increase the possibility of cold injury.

### CLOTHING

When in cold weather, you should wear several layers of loose clothing and dress as lightly as the weather permits. This reduces the danger of excessive perspiration followed by chilling. It is better if the body is slightly cold and producing heat than overly warm and sweating toward dehydration. Wet clothing adds to the possibility of cold injury.

#### HOW TO USE THE WIND CHILL CHART

Find the wind speed in the left-hand column, then read across to the column under the actual temperature. This number is the equivalent temperature which would be acting on any exposed skin. For example, if the wind is blowing at 20 mph and the actual temperature is 10° F, the effect on bare skin would be the same as a temperature reading of -25° F under calm conditions. Any movement has the same cooling effect as the wind. Running, skiing, or riding in an open vehicle must be considered in using the wind chill chart.

☆ GPO : 1983 O - 417-503

#### WIND CHILL CHART FOR FAHRENHEIT TEMPERATURES

| ESTIMATED WIND SPEED<br>IN MPH                                       | ACTUAL THERMOMETER READING (° F)  |    |    |     |     |  |     |     |              |      |      |      |
|--|---|----|----|-----|-----|--|-----|-----|--------------|------|------|------|
|  | 50  | 40 | 30 | 20  | 10  | 0  | -10 | -20 | -30          | -40  | -50  | -60  |
| EQUVALENT TEMPERATURE (° F)  |   |    |    |     |     |  |     |     |              |      |      |      |
| CALM   | 50  | 40 | 30 | 20  | 10  | 0  | -10 | -20 | -30          | -40  | -50  | -60  |
| 5  | 48  | 37 | 27 | 16  | 6   | -5   | -15 | -26 | -36          | -47  | -57  | -68  |
| 10   | 40  | 28 | 16 | 4   | -9  | -24  | -33 | -46 | -58          | -70  | -83  | -95  |
| 15   | 36  | 22 | 9  | -5  | -18 | -32  | -45 | -58 | -72          | -85  | -99  | -112 |
| 20   | 32  | 18 | 4  | -10 | -25 | -39  | -53 | -67 | -82          | -96  | -110 | -124 |
| 25   | 30  | 16 | 0  | -15 | -29 | -44  | -59 | -74 | -88          | -104 | -118 | -133 |
| 30   | 28  | 13 | -2 | -18 | -33 | -48  | -63 | -79 | -94          | -109 | -125 | -140 |
| 35   | 27  | 11 | -4 | -21 | -35 | -51  | -67 | -82 | -96          | -113 | -129 | -145 |
| 40   | 26  | 10 | -6 | -24 | -37 | -53  | -69 | -85 | -100         | -116 | -132 | -148 |
| WIND SPEEDS<br>ABOVE 40 MPH<br>HAVE LITTLE<br>ADDITIONAL<br>EFFECT.  | LITTLE DANGER FOR<br>THE PROPERLY CLOTHED<br>PERSON. MAXIMUM DANGER<br>OF FALSE SENSE OF<br>SECURITY. |    |    |     |     | INCREASING<br>DANGER OF<br>FREEZING<br>EXPOSED<br>FLESH. |     |     | GREAT DANGER |      |      |      |
| TRENCH FOOT AND IMMERSION FOOT MAY OCCUR AT ANY POINT ON THIS CHART. |   |    |    |     |     |  |     |     |              |      |      |      |

### PHYSICAL MAKEUP

Physical fatigue leads to inactivity, personal neglect, carelessness, and less heat production. These, in turn, increase the risk of cold injury. Individuals who have had a cold injury before have a higher risk of being injured again.

### PSYCHOLOGICAL FACTORS

Mental fatigue and fear lessen the body's ability to rewarm itself and thus increase the possibility of cold injury. Depressed or unresponsive individuals are also at a higher risk of cold injury, because they are less active and tend to be careless about protecting themselves.

### OTHER FACTORS

Individuals are also at risk of cold injury if they are:

- Often in contact with the ground.
- Immobile for long periods of time, such as while riding in a crowded vehicle.
- Standing in water.
- Out in the cold for days without being warmed.
- Deprived of an adequate diet and rest.
- Careless about personal hygiene.

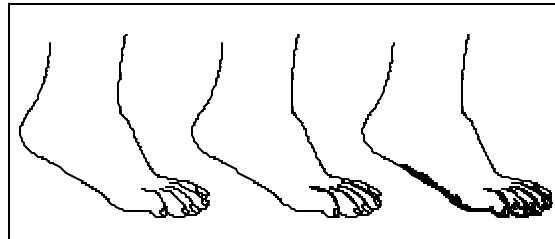
### TYPES OF COLD INJURIES

People exposed to severe cold can suffer from the following conditions: **frostbite**, immersion foot/trench foot, **hypothermia**, snow blindness, and **dehydration**.

### FROSTBITE

Frostbite is the most common injury resulting from exposure to the cold. Ice crystals form in body tissues exposed to temperatures below freezing. The crystals restrict blood flow to the injured parts and are like daggers that puncture cell membranes as they grow larger. Body parts most easily frostbitten are the cheeks, nose, ears, chin, forehead, wrists, hands, and feet. People suffering from frostbite may not realize it, since the injured part may be numb from the cold.

There are different degrees of frostbite depending on the extent of tissue damage. A **superficial** cold injury can usually be characterized by numbness and tingling or “pins and needles” sensations. It involves the skin and the tissue just beneath the skin. Deep frostbite, on the other hand, involves freezing of the **subcutaneous** tissue, and possibly even muscle and bone. With a deep cold injury, victims are often unaware of a problem until the affected part feels like a stump or block of wood. Severe frostbite may result in infection or gangrene and may require surgical removal of the injured part.



*Signs of Frostbite*

Signs of superficial frostbite include:

- Redness of the skin on light-skinned individuals; grayish coloring of the skin on dark-skinned individuals
- Blisters in 24 to 36 hours
- Sloughing of the skin

Signs of deep frostbite include:

- Signs of superficial frostbite
- Painless or numb unthawed skin that is pale-yellowish and waxy looking
- Frozen, swollen tissue that is like wood to the touch
- Blisters in 12 to 36 hours

### *Treatment of Frostbite*

Treat superficial frostbite as follows:

1. Move the victim out of the cold and wind.
  2. Keep the victim warm; re-warm the affected parts gently and slowly. Explain to the victim that he or she will experience pain when warmth restores feeling to the injured part.
    - a. Cover cheeks, ears, and nose with the victim's and/or your hands.
    - b. Put fingertips under the victim's armpits.
    - c. Place the victim's feet under the clothing of another person next to that person's belly.
  3. **Insulate** injured parts by covering them with a blanket or dry clothing.
  4. Loosen tight clothing and remove wet clothing.
  5. Encourage the victim to exercise carefully, avoiding further injury.
  6. Seek medical treatment.
- Avoid having the victim walk on frostbitten feet, especially if they thaw. If the victim must walk, it is less dangerous while his or her feet are frozen.
  - Do not rub the injured part with snow or apply cold water packs.
  - Do not warm the injured part by massage; ice crystals in the tissues will damage more cells when rubbed.
  - Do not expose the injured part to open fire; the frozen part may burn because of lack of feeling.
  - Do not have the victim move the injured part to increase circulation.
  - Do not break any blisters.
  - Do not use ointments or other medications.
  - Do not let the victim use alcohol or tobacco. Alcohol reduces the body's resistance to cold, and tobacco decreases blood circulation.

Deep frostbite is very serious and requires extra care to reduce or avoid losing all or parts of the fingers, toes, hands, or feet. If possible, transport the victim to a hospital or contact emergency medical services immediately, since it is preferable that deep frostbite injuries be rewarmed under medical supervision. If this is not possible, re-warm the injured parts, protect them from re-freezing, and seek medical help as soon as possible.

#### *The Don'ts of Treating Frostbite*

- Do not attempt to thaw the affected part if you believe you cannot keep it warm until the victim receives medical treatment. It is extremely dangerous for an injured part to re-freeze after warming. It is less dangerous to leave the part frozen than to warm it and have it re-freeze.

#### *IMMERSION FOOT/TRENCH FOOT*

Immersion foot and trench foot result from long exposure of the feet to wet conditions at temperatures between approximately 32° and 50°F. Keeping your feet in damp or wet socks and shoes or tightly laced boots for long periods of time may affect circulation and contribute to injury. Inactivity also increases the risk of immersion foot/trench foot. This injury can be very serious, leading to loss of toes or parts of the feet.

#### *Signs of Immersion Foot and Trench Foot*

Symptoms of immersion foot/trench foot in the primary stage include affected parts

that are cold, numb, and painless. These parts may then begin to feel hot, with burning and shooting pains. In the advanced stage of immersion foot/trench foot, your pulse decreases and the skin becomes pale with a bluish cast. Redness, blistering, swelling, heat, hemorrhages, and gangrene may follow.

### *Treatment of Immersion foot and Trench foot*

Treat immersion foot/trench foot as follows:

1. Gradually re-warm the affected foot by exposure to warm air. Explain to the victim that he or she may experience pain and burning when you re-warm the foot.
  - a. Do not massage or moisten skin.
  - b. Do not apply ice.
  - c. Do not expose injured parts to open fire or other sources of heat. Warm by covering with loose, dry clothing or other coverings instead.
2. Protect the affected foot from trauma or infection.
3. Elevate the foot to relieve swelling.
4. Dry the foot thoroughly; avoid walking.
5. Seek medical treatment.

### **HYPOTHERMIA**

Hypothermia is a general cooling of the body to a temperature below 95°F caused by continued exposure to low or rapidly dropping temperatures, cold moisture or wind, snow, or ice. With hypothermia, the body loses heat faster than it can produce it. Inadequate insulation, fatigue, poor physical condition, dehydration, faulty blood circulation, alcohol, trauma, and immersion in cold water can bring on this condition. People at high risk of hypothermia include infants, older people, people with lim-

ited mobility due to illness or other medical conditions, very thin people, and people with heart and lung problems.

Remember, cold weather affects the body slowly and almost without notice. Even when well-protected by clothing, a person may suffer cold injuries if exposed to low temperatures for long periods of time. As the body cools, it goes through several stages of discomfort and problems.

### *Signs of Hypothermia*

- Shivering or trembling which indicates mild hypothermia and will eventually stop as body temperature drops
- Cold skin
- Weakness
- Dizziness
- Drowsiness and mental slowness or confusion
- Uncoordinated movements and slurred speech
- Low body temperature; in severe hypothermia, 90°F or below
- Stiff or rigid muscles
- Decreasing pulse and breathing rate
- Unconsciousness
- Shock, coma, and death, which may result as body temperature drops and the body freezes.



### *Treatment of Hypothermia*

Except in the most severe cases, the treatment for hypothermia is directed toward re-warming the body evenly and without delay.

Treat mild hypothermia as follows:

1. Re-warm the victim slowly.
  - a. If possible, move the victim inside, remove any wet clothing, and cover him or her with blankets. Avoid warming the victim quickly with hot baths, electric blankets, or heat lamps.
  - b. If you cannot move the victim inside, remove any wet clothing and rewarm him or her beside a campfire or using the body heat from another person.
2. Keep the victim dry and protected with clothing, blankets, towels, a sleeping bag, or even newspapers.
3. Keep the victim awake.
4. Do not raise the victim's feet or legs, since blood in the extremities is colder than in the rest of the body and may further chill the body's core.
5. Give the victim warm liquids gradually. Do not give the victim alcohol. Do not force liquids on an unconscious victim.
6. Be prepared to start basic life-support measures.
7. Seek medical treatment immediately.

Treating a person with severe hypothermia is extremely dangerous because of the possibility of shock and disturbances of the heartbeat while re-warming. If possible, as you begin to re-warm the victim, transport him or her to a hospital or contact Emergency Medical

Services immediately. If this is not possible, treat the victim gently since the heart is weak when the body is cold, stabilize the victim's body temperature by keeping him or her from losing more body heat, and continue to keep the victim warm until you can get him or her medical treatment.

### *SNOW BLINDNESS*

Snow blindness is the effect the glare from an ice field, or snowfield, has on the eyes. It is more likely to occur in hazy, cloudy weather, since people tend to protect their eyes when the sun is shining and believe protection is unnecessary on cloudy days. If a person waits until he or she feels discomfort or pain to use protective eyewear, a deep burn of the eyes may have already occurred.

#### *Signs of Snow Blindness*

- A sensation of grit in the eyes
- Pain in and over the eyes made worse with eye movement
- Watery and red eyes
- Headache
- Increased pain with exposure to light

#### *Treatment of Snow Blindness*

Treat snow blindness as follows:

1. Cover the eyes with a dark cloth to discourage painful eye movement.
2. Try to give the eyes complete rest without exposure to light. If this is not possible, protect the eyes with dark bandages or very dark glasses.
3. Seek medical treatment. In most cases, once exposure to sunlight stops, the eyes heal in a few days without permanent damage.

## **DEHYDRATION**

Dehydration occurs when the body loses too much fluid, salt, and minerals. As mentioned in the previous lesson, you can lose large amounts of fluid and salt through sweating. This loss creates an imbalance of fluids, and dehydration occurs when fluids are not replaced.

Dehydration can occur in both hot and cold climates. In cold weather, sweat evaporates quickly and heavy layers of clothing absorb it, making dehydration more difficult to detect because the signs of sweating are less noticeable. Thus, the danger of dehydration during strenuous cold weather activities can become a serious problem.

The symptoms of cold weather dehydration are similar to those of heat exhaustion. Treat dehydration as follows:

1. Move the victim out of the wind and cold, and keep him or her warm.
2. Loosen the victim's clothes to promote circulation.
3. Ensure the victim receives proper fluid replacement, rest, and prompt medical treatment.

## **PREVENTION OF COLD INJURIES**

You can prevent many cold weather injuries by taking proper care and precautions when participating in cold weather activities. Be sure to receive adequate nutrition, hot meals, and warm fluids. Get enough rest. Practice good hygiene. Wear the right clothing and protective gear. Do not forget to protect your eyes, ears, and face. Wear layers of clothing so you can remove outer layers if you begin to perspire. Avoid tight clothes that interfere with

circulation. Replace or remove any clothing that gets wet as soon as possible.

Since you may not feel cold injuries because of cold's numbing effect, always try to go out into cold weather with a partner, so you can check each other for signs of injury. Exercise and keep active to maintain steady circulation and improve resistance to the cold. Many cold weather injuries can be avoided by planning ahead, staying alert, and using common sense.

## **CONCLUSION**

Whether or not snow and frost are present, cold weather injuries, such as frostbite or hypothermia, can be a threat to safety. Knowing the proper ways to treat these injuries is very important because, although it might seem like a good idea to re-warm the victim, you may in fact be making the injury worse. Read over the first aid measures outlined in this lesson, consider how to prevent these injuries in the first place, and you will not be caught off guard when you are exposed to the cold.